We claim:

1. A method of forming a SiGe layer having a relatively high Ge content, comprising:

preparing a silicon substrate;

depositing a layer of strained SiGe to a thickness of between about 100 nm to 500 nm, wherein the Ge content of the SiGe layer is equal to or greater than 20%, by molecular weight;

implanting H_2^+ ions into the SiGe layer;

irradiating the substrate and SiGe layer, to relax the SiGe layer; and

depositing a layer of tensile-strained silicon on the relaxed SiGe layer to a thickness of at least 100 nm.

2. The method of claim 1 which further includes, prior to said implanting, depositing a layer of silicon oxide on the SiGe layer to a thickness of between about 5 nm to 30 nm.

3. The method of claim 1 which further includes, after said irradiating, depositing a layer of relaxed SiGe having a thickness of at least 100nm on the relaxed SiGe layer.

4. The method of claim 3 which further includes depositing an epitaxial layer of tensile-strained silicon on the relaxed SiGe layer, wherein the tensile-strained SiGe layer has a thickness of between about 5 nm to 30 nm.

5. The method of claim 1 wherein said irradiating includes irradiating the substrate and SiGe layer at a power of between about 200W and 2000W for between about 30 seconds to 30 minutes.

6. The method of claim 1 wherein said implanting includes implanting H_2^+ ions at a dose of between about $1\cdot10^{16}$ cm^{-2} to $5\cdot10^{16}$ cm^{-2}, at an energy of between about 15 keV to 150 keV.

7. The method of claim 1 which includes implanting H_2^+ ions and simultaneously implanting ions taken from the group of ions consisting of boron, helium and silicon.

8. A method of forming a SiGe layer having a relatively high Ge content, comprising:

preparing a silicon substrate;

depositing a layer of strained SiGe to a thickness of between about 100 nm to 500 nm, wherein the Ge content of the SiGe layer is equal to or greater than 20%, by molecular weight;

implanting H_2^+ ions into the SiGe layer at a dose of between about 2e14 cm^{-2} to 2e16 cm^{-2}, at an energy of between about 15 keV to 150 keV;

irradiating the substrate and SiGe layer, to relax the SiGe layer, at about 2.45 GHz and at a power of between about 200W to 2000W for between about 30 seconds and 30 minutes; and

depositing a layer of tensile-strained silicon on the relaxed SiGe layer to a thickness of between about 5 nm to 30 nm.

9. The method of claim 8 which further includes, prior to said implanting, depositing a layer of silicon oxide on the SiGe layer to a thickness of between about 5 nm to 30 nm.

10. The method of claim 8 which further includes, after said irradiating, depositing a layer of relaxed SiGe having a thickness of at least 100 nm on the relaxed SiGe layer.

11. The method of claim 8 which further includes implanting H_2^+ ions at a reduced dose and simultaneously implanting ions taken from the group of ions consisting of boron, helium and silicon.

12. A method of forming a SiGe layer having a relatively high Ge content, comprising:

preparing a silicon substrate;

depositing a layer of strained SiGe to a thickness of between about 100 nm to 500 nm, wherein the Ge content of the SiGe layer is equal to or greater than 20%, by molecular weight;

implanting H_2^+ ions into the SiGe layer at a dose of between about 2e14 cm^{-2} to 2e16 cm^{-2}, at an energy of between about 15 keV to 150 keV;

irradiating the substrate and SiGe layer, to relax the SiGe layer to a relaxation of at least 50%; and

depositing a layer of tensile-strained silicon on the relaxed SiGe layer to a thickness of between about 5 nm to 30 nm.

13. The method of claim 12 which further includes, prior to said implanting, depositing a layer of silicon oxide on the SiGe layer to a thickness of between about 5 nm to 30 nm.

14. The method of claim 12 wherein said irradiating includes irradiating the substrate and SiGe layer at a power of between about 200W and 2000W for between about 30 seconds to 30 minutes.

15. The method of claim 12 which further includes, after said thermal annealing, depositing a layer of relaxed SiGe having a thickness of at least 100 nm on the relaxed SiGe layer.

16. The method of claim 12 which further includes implanting H_2^+ ions at a reduced dose and simultaneously implanting ions taken from the group of ions consisting of Boron, Helium and Silicon.